Dropping In a Microgravity Environment

Educators Resource Guide

This guide contains assistance for teachers and advisors with the topic of microgravity. The steps for developing an experiment and proposal are outlined with suggestions for producing a polished proposal.

Free falling experiment rig in 2.2 Second Drop Tower at NASA Glenn Research Center

National Aeronautics and
Space Administration
Glenn Research Center

revision date: 05/07/02

DIME Educators Resource Guide

Contents

Introducing DIME

This guide is written to assist the teacher/advisor with the topic of microgravity and suggests several areas that lend themselves to productive microgravity research. The steps for developing an experiment and proposal are outlined with suggestions for producing a polished proposal. A brief description of the drop tower facility is also included here. Resources relevant to increasing your knowledge of microgravity are included at the end of the guide.

The Stuff of Dreams

For countless generations, space exploration was the stuff of dreams and science fiction. Now the thrill, joy, and challenges of NASA research are accessible to high-school classrooms. NASA is dropping student experiments alongside those of scientists'. This opportunity to actually explore microgravity is now within the grasp of your class. What characterizes students whose experiments NASA has dropped is hard work, some ingenuity, and unbridled curiosity. Your students, too, can participate in microgravity exploration. For their efforts, your students, like their peers before them, will gain truly extraordinary learning opportunities, a sense of accomplishment, and experiences rich enough to endure a lifetime.

Design, Build, Drop

The Dropping In a Microgravity Environment (DIME) competition provides several key milestone steps to support and clarify your efforts.

1. Select an experiment. You may refer to page 8 for guidelines.
2. Develop a proposal in accordance with the current Program Announcement.
3. Conduct normal gravity research related to your experiment.
4. Submit an official proposal as detailed in the current Program Announcement.
5. If your experiment is selected, NASA will supply additional technical support regarding design and safety issues.
6. Participate in the Drop Days.
7. Prepare your final report.

Detailed information about the design of a DIME experiment is contained in the DIME Experiment Design Requirements document. This contains safety constraints on the experiment and therefore should be consulted when preparing a proposal.

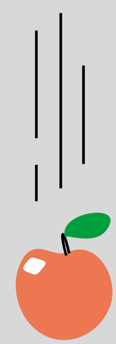
Defining Microgravity

What is this condition called *MICROGRAVITY*? A microgravity environment is one in which:

1. the apparent weight of an object is less than its actual weight, or
2. some of the effects of gravity are greatly reduced compared to those experienced on Earth.

In other words, it is a term describing apparent weightlessness or reduced weight. Apparent weight is the weight measured when an object is put on a scale in a given environment and actual weight is the force of Earth's gravitational pull on an object.

Newton's apple in free fall



Where Do We Find Microgravity?

Microgravity can be achieved regardless of the local force of gravity. It can occur where gravity is low, such as outside our Solar System, but it also occurs whenever an object is in free fall, where the only (net) force acting on the object is gravity.

Scientists achieve a microgravity environment for different amounts of time in several ways: drop towers provide up to 10 seconds, research aircraft provide up to 20 seconds, sounding rockets provide tens of minutes, the Shuttle provides days, and the International Space Station provides days, weeks, and months.

2.2 Second Drop Tower Facility

As you plan your experiment, you will need to consider the arrangements NASA has made to drop it in the drop tower. Here is a brief introduction to the NASA Glenn 2.2 Second Drop Tower.

Historical Background

The inaugural drop in the NASA Glenn Research Center's 2.2 Second Drop Tower was made in 1959. For the first decade of its history, most of the research done in the tower was geared towards understanding how equipment would work on orbit. The Space Race was on and U.S. scientists and engineers needed to understand how technologies and persons would function in a free fall environment. They realized that performing drop tests on Earth gave them a brief look at how things would work in the extended free fall state of orbit. The researchers figured out how astronauts would drink, how liquid fuel could be moved to an engine, and how that fuel would ignite in the engine.

Research continues today where some experimental research requires only a few seconds of microgravity time. Drop towers are used frequently as test beds for more elaborate, longer duration space shuttle and International Space Station experiments.

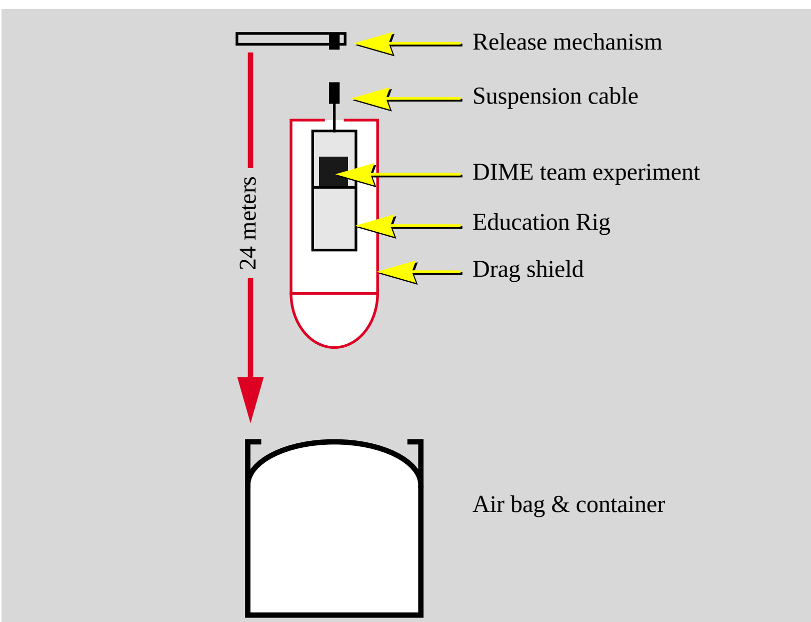
Your students will carry on this vital tradition of research.

DIME Experiments Drop in the NASA 2.2 Second Drop Tower

Experiments in the 2.2 Second Drop Tower are assembled in an experiment carrier. This experiment carrier is then placed inside a drag shield to shelter the experiment carrier from the decelerating effects of the air as the entire package accelerates to over 50 miles per hour (80 kilometers per hour). See the drop tower schematic on this page, the cutaway drawing of the drop tower shown on page 5, and the 2.2 Second Drop Tower facility web page (see page 11).

The DIME program uses a special version of the experiment carrier called the Education Rig. The Education Rig has a standard mounting location for DIME experiments. At that location, the Education Rig supplies standard connections for electrical power, control signals, and signal recording equipment. A video camera is also focused on the

DIME 2002 team preparing their experiment on the Education Rig



2.2 Second Drop Tower schematic (not to scale)

Drag shield being assembled with an experiment inside

2.2 Second Drop Tower Facility (continued)

experiment location. These services allow the Education Rig to support a variety of experiment types.

Your experiment needs to be mounted on an experiment mounting plate supplied to each selected team. The entire experiment (including mounting plate) must be less than 25 pounds (11.4 kilograms) and must have dimensions no greater than 12 by 12 by 12 inches (30.4 by 30.4 by 30.4 centimeters). Sturdy construction is necessary to withstand the shock of landing at the bottom.

Electrical power available to the experiment will be at 12 and 28 volts DC. Control signals are also available to control the experiment before it is dropped and during the free fall time. Analog and digital signal recording is provided by the Education Rig for experiment-generated signals such as from pressure, temperature, or position sensors.

The Education Rig has a video camera which allows a view of the experiment to be recorded on a drop tower facility video recorder.

Conditions in the 2.2 Second Drop Tower facility are maintained at room temperature and standard pressure.

General Safety Requirements

Test operations at the 2.2 Second Drop Tower are subject to the NASA Glenn safety review system. The objectives of this system are to avoid undue risks, injury to personnel, damage to property, or disruption of operations. Because human beings work on the experiments and damage to the facility is possible, the safety requirements for DIME experiments are detailed and stringent.

Safety requirements apply to the experiment apparatus and operations in the drop tower. These safety requirements lead to some restrictions on the content of experiments.

For detailed safety requirements relating to chemicals, specimens, etc., consult the DIME Experiment Design Requirements document.

Facility Accessibility

Due to the nature of the facility and the age of the building, the top floor is accessible only by climbing four short flights of stairs. The DIME student teams are only observers at this location since the facility operators are handling the experiment at that point. These activities may also be observed at other locations within the facility.

All other facility laboratories and areas where the DIME student teams will work are wheelchair accessible.

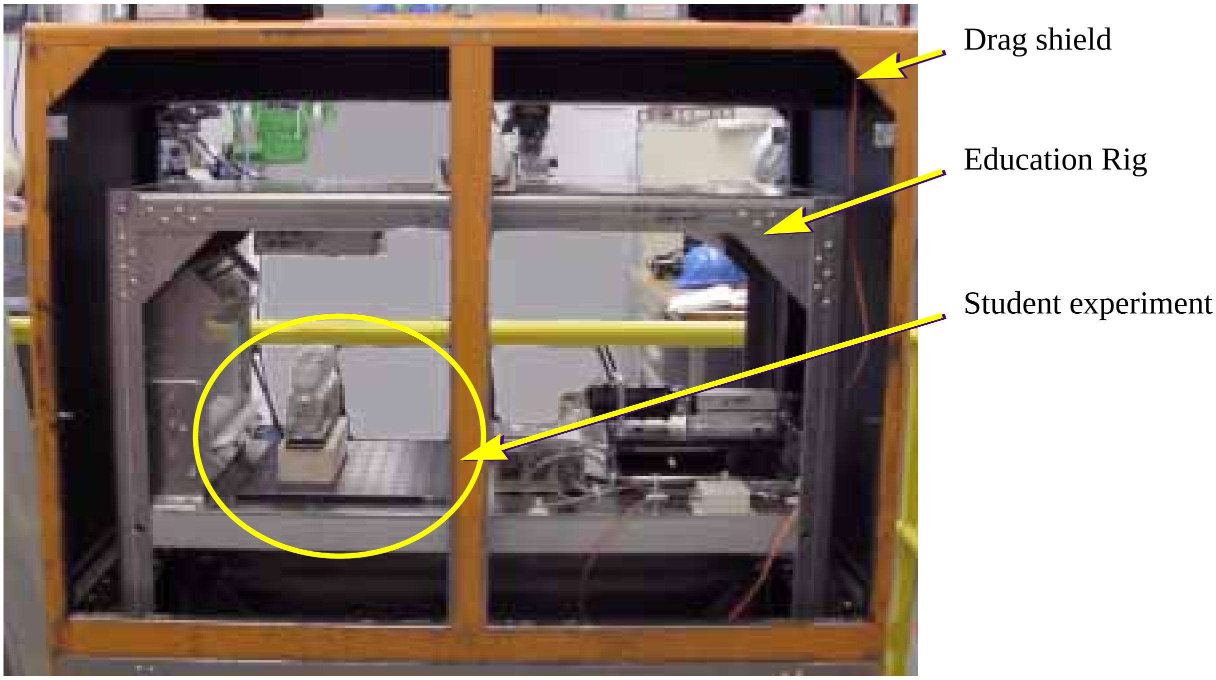
Essential Information

The DIME Experiment Design Requirements Document contains detailed information about DIME experiment design requirements and integrating the experiment into the Education Rig. Any team that is designing and constructing their experiment will need to read and comply with the details found in that document.

DIME 2002 team adjust the Education Rig camera for their fluid experiment

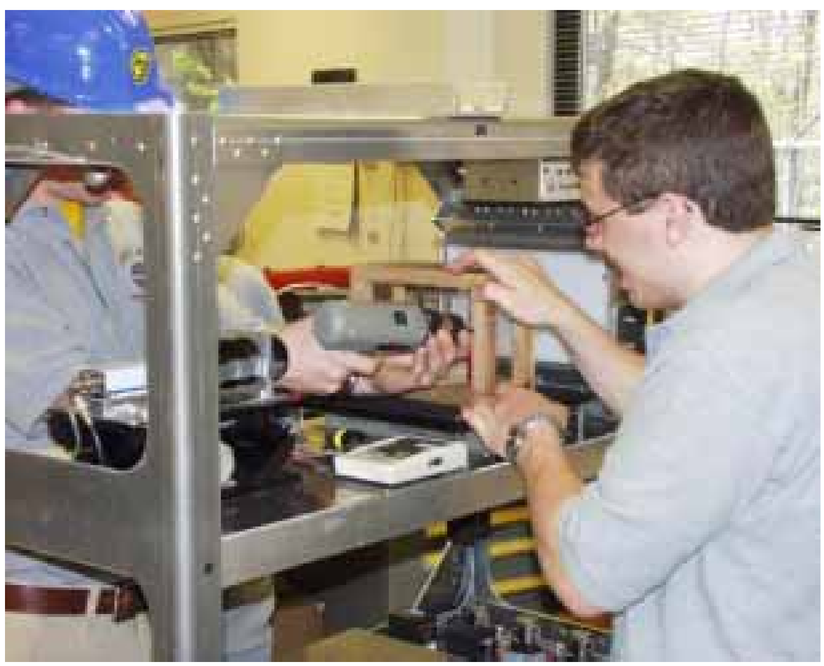
Drag shield (with experiment inside) falling in the drop tower

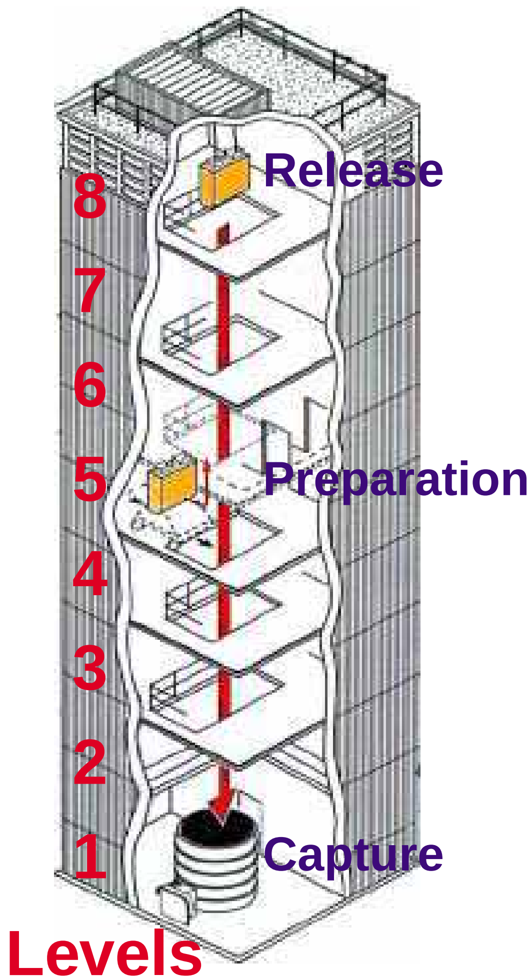
2.2 Second Drop Tower Facility (continued)



DIME 2001 fluid experiment (circled) installed in the Education Rig (gray) which has been loaded into the drag shield (orange).

DIME 2002 team members install the sides of the sample chamber while preparing their experiment for a drop.





2.2 Second Drop Tower Facility at the NASA Glenn Research Center, Cleveland, Ohio with the various levels identified. An experiment is prepared on level 5, raised to level 8 for release, and then captured in an air bag on level 1.

Drop Tower Experiment Ideas

Free fall offers many kinds of opportunities for experimentation. This guide suggests three broad areas for useful and productive drop tower research. Do not let these suggestions limit your team's creativity and imagination.

Effects of Gravity

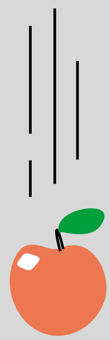
As a consequence of our life on Earth, we experience our weight as an effect of gravity. What other effects of gravity do we experience in everyday life?

- the shape of a birthday candle flame
- a drop of water in a spoon
- an hourglass
- a hot air balloon rising
- a stone sinking and a piece of wood floating in a pond
- the Moon orbits the Earth

One thing these all have in common is gravity. Gravitational forces cause convection (moving air) around the candle flame which elongates the flame. Gravity causes the drop of water to spread out when held in a spoon. The sand grains fall through the hourglass due to gravity. A hot air balloon rises due to density differences between the hot air within the balloon and the surrounding air. Similarly, a stone sinks and wood floats in water due to density differences. Mutual gravitational forces between the Moon and Earth cause the Moon to stay in orbit around the Earth.

How would these phenomena change if gravitational effects were drastically reduced or eliminated? With no gravity-driven convection, what shape would the candle flame become? In what shape would a drop of water become? What would the sand of an hourglass do with no gravity or drastically reduced gravity? Where would a hot air balloon go? What would a stone and piece of wood do in a pond with no gravity? Where would the Moon go if gravity were drastically reduced or eliminated?

Newton's apple in free fall



We can answer these types of questions performing experiments in a microgravity environment. A microgravity environment is an environment where the apparent weight of an object is less than its actual weight which is due to Earth's gravity alone.

An alternative definition of microgravity is an environment where some of the effects of gravity are reduced compared to what we experience on Earth. Of course, the gravitational attraction among objects isn't changed under microgravity conditions, but apparent weight is reduced and density differences no longer lead to sedimentation and buoyancy currents.

So how do you get microgravity conditions? The simplest approach is to drop things. Objects in a free fall within a gravitational field expreience reduced effects of gravity due to the equal acceleration of the objects. This is the basis for "weightlessness" of astronauts on the International Space Station and the Shuttle.

Experiments carried out under microgravity conditions can help us better appreciate the physics of daily life.

Three Themes for Projects

A. Physical Science

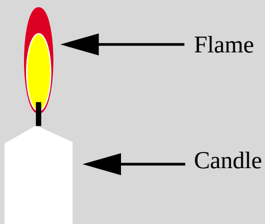
Many basic physical science phenomena have gravity as a predominant effect. By operating an experiment in free-fall, the phenomena may be studied in the absence of gravitational effects.

An hourglass operates by sand particles due to gravity. A pendulum operates by trading potential energy (due to gravity) with kinetic energy. An airplane flies by balancing gravitational forces with lift forces.

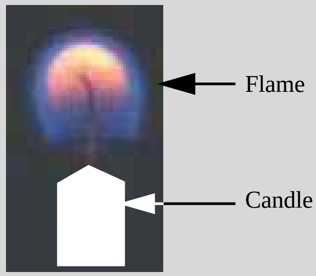
Galileo tested free fall conditions here

Drop Tower Experiment Ideas (continued)

Candle Flame in Normal Earth's Gravity



Candle Flame in Microgravity



B. Combustion Science

The combustion process is central to life in the 21st century. It can power our automobiles, enable energy conversion to electricity, heat our homes, cook our food, and, in the process, add many pollutants to our atmosphere. Yet we have much to learn about the science of combustion.

Buoyancy-driven convection currents around flames on Earth cause smoke to rise and flames to be tear-drop shaped. Dense combustion products that escape these currents settle to the ground. Free fall gives us the opportunity to perform research in an environment where effects of gravity are drastically reduced. NASA's microgravity combustion research program focuses on the phenomena of ignition, flammability, and extinction of a variety of fuels, in the form of solids, liquids (droplets), or gasses.

The study of combustion where buoyancy-driven convection does not occur is a critical area for those travelling in space.

C. Fluid Physics

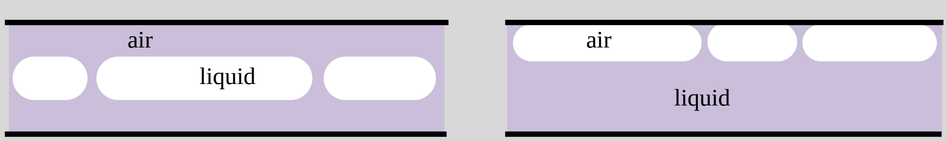
Just as we take gravity for granted on a daily basis, there are many important aspects of fluids that are the result of gravity. A defining characteristic of fluids is that they take on the shape of their containers: we can pour ourselves a cup of milk, we can breathe air anywhere in our classroom, and lemonade fills up the bottom of a pitcher. These simple examples all involve sedimentation as an effect of gravity. Are there other properties of fluids that we could study if we reduced such effects of gravity? Fluid physics is the study of the motion of fluids and related phenomena. Because three of the four states of matter (gas, plasma, and liquid) are fluid, and even the fourth (solid) behaves like a fluid under many conditions, fluid physics is vital to understanding, controlling, and improving all of our industrial, as well as natural, processes.

With a reduction of sedimentation and buoyancy-driven convection, researchers can further our understanding of simple and complex fluids, study how fluids interact with other fluids and with their containers, and better plan how to move fluids around in a variety of settings.

The 2.2 seconds of free fall in the drop tower offers an opportunity (though brief) to study some features of fluids and combustion.

Two Phase Gas / Liquid Flow in Microgravity

Air bubbles and liquid moving right



Microgravity environment

Normal one-g environment

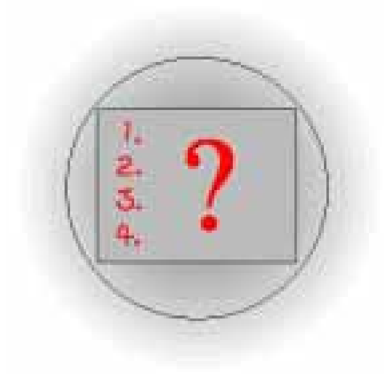
Six Steps to Develop an Experiment

Planning a productive experiment involves studying the free fall environment and how it affects things you find interesting. It is important to select something to study that has a realistic chance of being affected by the conditions of free fall in 2.2 seconds. Don't let these suggestions limit your team's creativity and imagination.

I. Consider the effects of gravity

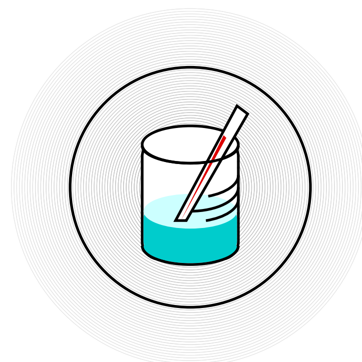
One way to plan an experiment involving microgravity is to study first the effects of gravity that we experience on a daily basis on Earth. Many scientific principles, such as the way heat moves to create weather and to form ocean currents as well as mountains, are greatly influenced by gravity. To understand why hot fluids rise and cool fluids fall, we need to take into account the density of fluids and the forces on them. Buoyancy-driven convection is the end result and thus water boils and evaporates easily here on Earth.

Thus, begin first to develop an experimental idea by thinking about how gravity influences the behavior of fluids, flames, and some physics principles here on Earth. You are then ready to ask yourself, how will that behavior change under a microgravity condition or how would things around us be different if we were situated in a microgravity environment?



II. Consider the effects of those microgravity conditions

In particular select an effect of gravity that may be reduced in a microgravity environment. For example, reduction in the gravitational effects will cause two liquids of different density to mix together differently than in a 1-g environment. Or consider how sand would fall through air in an hourglass. The preceding section on Experiment Ideas introduces three common areas that lend themselves to study in a microgravity environment and will help you select an idea for experimentation.

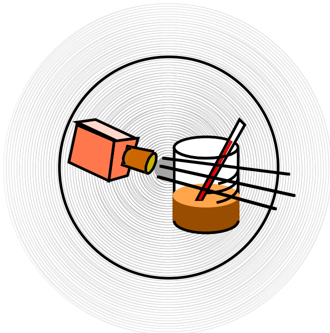


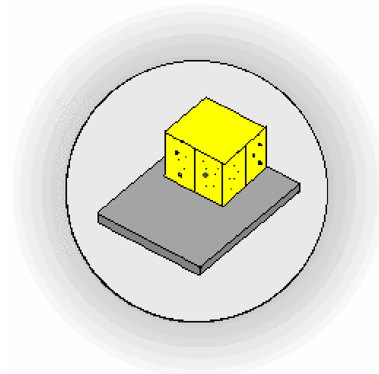
III. Carry out ground-based experiments

Thinking about the science concept that you want to study in microgravity, design a way to study these effects in our 1-g environment. Select the one variable that you plan to test in the drop tower and test that same variable here on Earth. In order to anticipate a change or difference in microgravity, you need to first understand and describe what it does in 1-g. For example, if you are interested in the various results of mixing different liquids, you could observe the mixing with the two liquids in numerous orientations in the laboratory, such as heavy liquid on top, on a side, or underneath. Think about which orientation would be most affected in microgravity.

Since teams will have only a few drop opportunities, select the variable to be tested carefully. The on-Earth study will be critical in helping you to decide how to design the experiment for the drop tower.

Six Steps to Develop an Experiment (continued)





IV. Think of tools needed to study and to measure those effects

Your experiment could make use of DC power and recording (video and analog signal) equipment provided by NASA. Electrically powered experiments are classified as "active." For example, a team might construct a small electrical device with sources of heat and temperature sensors to learn how heat is dissipated without the gravity-driven convection currents that help cool things in a 1–g environment.

"Passive" experiments may involve mechanical equipment and forces, such as magnetic repulsion. For example, a team might construct a sedimentation experiment in which different density liquids are observed on video during the free fall period.

V. Prepare and submit a proposal

Refer to the current year's DIME Program Announcement for the detailed requirements, including dates by which a proposal and other documentation must be submitted. Note that the entry process, however, is rigorous and disciplined in order to engage students in doing a science experiment following real laboratory research steps.

Good grammar and punctuation are a prerequisite. Professional scientists are accustomed to putting their proposals through several stages of review and revision prior to submission. Thus, your proposal may benefit from review by teachers, scientists, or engineers in your area.

VI. Build and test your experiment

If your experiment is selected for dropping in the NASA drop tower, your team now must produce the experiment hardware, thoroughly check it out, and fine-tune it in preparation for Drop Days. The experiment must be designed according to the requirements contained in the DIME Experiment Design Requirements document which is available from the DIME web site. That document also contains the safety requirements that must be met for experimental apparatus operated in the drop tower.

Scientists and engineers from NASA will be assigned as mentors for the student teams. Their role is to serve as a resource to the team during the design and construction phase.

If your proposal is not selected ...

At this stage, you have built a solid foundation for your work. If your experiment is not selected for dropping in the NASA drop tower, think about areas of the proposal that may have weakened the proposal. For example:

1. Did it meet design and format requirements and submission deadlines?
2. Is microgravity critical to the proposed experiment?
3. Was it an effective experiment for microgravity in 2.2 seconds?

Consider what changes could to be made to the proposal as a head start for next year's competition. You might also consider how the team might enter the experiment in science or engineering fairs.

Helpful Suggestions

Experienced researchers take extra care to produce polished proposals, and their techniques can be valuable to your team. Here are several suggestions. The possibilities for experimentation in the DIME program are open-ended and broad enough to draw in students with many kinds of interests and abilities.

Emphasize Teamwork

Many skills are needed for science experimentation and the work is more productive when shared by people who are skilled in different areas. Pay specific attention to putting together a diverse team which shares the work and rewards fairly. Take time to plan realistic schedules.

Communicate Your Goals and Successes

Clear communication is essential to a winning Competition Entry and is also important throughout your project. Building a team and finding outside support for its work depends on being able to explain briefly and clearly to people with many points of view what your team is doing and why it is important. Reporting on the successes of your project is an important way to earn your team the credit it deserves. Encourage students and advisors who enjoy communicating clearly to be part of your team.

Enlist the Support of a Mentor or Consultant

Experimental science is usually learned through personal experience with other researchers rather than from books. As your team develops some experience in a field of research, you may be able to find someone outside your school, perhaps at a college or in industry, with experience in that field. Even just a few minutes of such a person's time can be invaluable to your team. As you seek such help, it will be essential to be prepared to explain clearly and briefly the scientific objective and technical plan for the team's proposal, as well as the type of help you hope to receive.

Arrange for Outside Review of Your Work

Set up a small informal advisory board to review your work a few times. Meet with them to describe the DIME program and your plans for experimentation. Ask them to proofread and review your work far enough in advance so the team has time to act on their suggestions.

Pay Scrupulous Attention to the Details

This paragraph is set in 12 point Times font, double-spaced, according to the requirements described for proposal entries. That is one of many DIME requirements. Judges who must review many entries appreciate clarity and simplicity. Also note the generous margins. Many of the requirements may, at first glance, seem needlessly arbitrary. Success in science experimentation depends on understanding the requirements and meeting them completely. Show that you can meet the requirements completely by submitting your proposal according to the guidelines in the DIME Program Announcement.

Resources for Teachers and Students

Dropping In a Microgravity Environment

http://microgravity.grc.nasa.gov/DIME.html

BASIC MICROGRAVITY INFORMATION

WHAT IS MICROGRAVITY?

A definition of microgravity and a description of how it is achieved.
http://microgravity.nasa.gov/wimg.html

A description of microgravity conditions, the effects it has on science experiments, and why it is important to conduct research in microgravity.
http://mgnews.msfc.nasa.gov/db/understanding_ug/understanding_ug.html

NASA GLENN 2.2 SECOND DROP TOWER FACILITY

A description of the 2.2 Second Drop Tower facility at the NASA Glenn Research Center in Cleveland, Ohio.
http://microgravity.grc.nasa.gov/drop2/index_text.htm

NASA GLENN MICROGRAVITY SCIENCE DIVISION EDUCATIONAL PAGES

The NASA Glenn Research Center's Microgravity Science Division provides a list of links for explanations of gravity and microgravity, microgravity activities, space laboratories, and other NASA educational sites.
http://microgravity.grc.nasa.gov/new/school.htm

SPACELINK MICROGRAVITY CLASSROOM ACTIVITIES

Microgravity is a condition of continuous free-fall. Conducting research in microgravity allows scientists to explore the details of many materials processes by studying phenomena normally obscured by gravity. The following microgravity resources are available from the SPACELINK web page.
http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Physical.Science/Microgravity/.index.html

Fall Into Mathematics — This NASA educational poster features Galileo Galilei, Isaac Newton, and Albert Einstein. There are three "Try This" problems and information about Microgravity Research and Research Platforms.

Mathematics of Microgravity— This publication identifies the underlying mathematics and physics principles that apply to microgravity.

Microgravity - A Teacher's Guide with Activities in Science, Mathematics, and Technology — This educator guide contains excellent background information accompanied by classroom activities that enable students to experiment with the forces and processes microgravity scientists are investigating today.

Microgravity-Fall Into Mathematics— The great minds of microgravity, Galileo, Newton, and Einstein, are the subjects of this NASA Educational Brief. Challenge your students with three "Try This" problems. The brief concludes with descriptions of four types of microgravity platforms.

Microgravity Demonstrator— The Microgravity Demonstrator is a tool designed by NASA engineers to demonstrate and teach principles of microgravity science and relationships to science and math. The manual provides instructions for building a microgravity demonstrator and includes classroom activities.

Resources for Teachers and Students (continued)

Additional (non-NASA) Microgravity Demonstrator resources are available from Rensselaer Polytechnic Institute, Troy, NY.
http://www.rpi.edu/locker/56/000756/vc_map_droptower.html
http://www.rpi.edu/locker/56/000756/DropTower/DropTowerDocument.html

Microgravity Video Resource Guide— This video resource guide contains background material and classroom activities which deal with the four scientific disciplines in NASA's microgravity research program. A videotape to accompany this guide may be ordered from NASA Central Operation of Resources for Educators (CORE) at:
http://core.nasa.gov/

MICROGRAVITY EDUCATION AND OUTREACH

MICROGRAVITY RESEARCH PROGRAM

The home page for NASA's Microgravity Research Program Office, with links to numerous related sites. The science disciplines within this program are biotechnology, combustion science, fluid physics, fundamental physics, and materials science. There is a link there for education and outreach material.
http://microgravity.nasa.gov/

EDUCATION PROGRAM AT THE NATIONAL CENTER FOR MICROGRAVITY RESEARCH ON FLUIDS AND COMBUSTION

This K–12 web site includes information about annual teacher and student summer internship programs as well as a teacher sabbatical program.
http://www.ncmr.org/education/k12.html

NASA EDUCATION RESOURCES

NASA SPACELINK – AN AERONAUTICS AND SPACE RESOURCE FOR EDUCATORS

Home page for NASA Spacelink, an electronic information system designed to provide current educational information related to the space program. Contains links to educational resource centers, instructional materials, and Spacelink hot topics.
http://spacelink.nasa.gov/

LIFTOFF TO SPACE EXPLORATION

Educational site featuring articles on "Today in Space," "Today in History," and "Kid's Space Story." Provides information on special interest topics such as current space shuttle missions, astronauts, and the International Space Station.
http://liftoff.msfc.nasa.gov

NASA QUEST

NASA Quest brings NASA people and science to K–12 classrooms via the Internet.
http://quest.arc.nasa.gov/

NASA HEADQUARTERS EDUCATION PROGRAM

Home page for NASA's Education Program. Contains links to various NASA educational opportunities.
http://education.nasa.gov/

Resources for Teachers and Students (continued)

NASA GLENN RESEARCH CENTER OFFICE OF EDUCATIONAL PROGRAMS

Home page for NASA Glenn Research Center's Office of Educational Programs, including links to their Student and Teacher Support areas.
`http://www.grc.nasa.gov/WWW/OEP/`

PROPOSAL PREPARATION

There are numerous style guidelines from professional organizations and publishing houses. Some of these resources are listed here. A DIME proposal needs to prepared according to the format requirements contained in the DIME Program Announcement. The format used for references should follow a standard editorial style, such as APA.

American Psychological Association (APA) Editorial Style

The APA style is established in the Publication Manual of the American Psychological Association.
`http://www.apa.org/books/4200061.html`

The University of Wisconsin-Madison Writing Center has on-line resources related to style, including the APA style.
`http://www.wisc.edu/writing/Handbook/`

A Quick APA Style Guide is available from the Winston-Salem State University.
`http://www.wssu.edu/library/guides/apa.asp`

The APA Style Essentials from the Vanguard University of Southern California.
`http://www.vanguard.edu/faculty/ddegelman/index.cfm?doc_id=796`

Elements of Style

A classic for writing style is The Elements of Style by William Strunk, Jr. An on-line version is available.
`http://www.bartleby.com/141/index.html`

Handbook for Writing

Sebranek, P., Meyer, V. & Kemper, D.(1997). Write for College: A Student Handbook. Wilmington, Massachusetts, Great Source Education Group, Inc.

A happy DIME 2002 team in front of their experiment and Education Rig after preparations were complete for their second drop.

Acknowledgements

The Dropping In a Microgravity Environment (DIME) program is a cooperative effort of many organizations.

- Microgravity Science Division at NASA Glenn Research Center, Cleveland, Ohio
- National Center for Microgravity Research on Fluids and Combustion at NASA Glenn Research Center, Cleveland, Ohio
- Physical Sciences Division of the Office of Biological and Physical Research at NASA Headquarters, Washington DC
- Office of Human Resources & Education at NASA Headquarters, Washington DC

The DIME program is carried out by personnel in the NASA Glenn Research Center Microgravity Science Division and the National Center for Microgravity Research on Fluids and Combustion.

Critical support also comes from the staff of the 2.2 Second Drop Tower facility and the Imaging Technology Center.

NOTE:
Use of commercial names and products does not imply an endorsement by NASA.

Documents and other information related to the DIME program may be accessed at the following World Wide Web address:

`http://microgravity.grc.nasa.gov/DIME.html`